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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/626,579	07/25/2003	Mark E. Thompson	10020/26501	9553
23838	7590	05/31/2005	EXAMINER	
KENYON & KENYON 1 BROADWAY NEW YORK, NY 10004			YAMNITZKY, MARIE ROSE	
			ART UNIT	PAPER NUMBER
			1774	

DATE MAILED: 05/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/626,579

Applicant(s)

THOMPSON ET AL.

Examiner

Marie R. Yamnitzky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2003 and four subsequent IDSs.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date rec'd 03 Nov 2003, 12 Oct 2004, 10 Dec 2004 and 24 Apr 2005.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

1. The Information Disclosure Statement received October 12, 2004 includes a 22 page non-patent literature document by Adamovich et al. from "MRS Spring Meeting, April 2002". It is not clear if the 22 pages constitute a handout presented to meeting attendees and/or if any of the 22 pages were displayed at the meeting such as in the form of slides or a poster presentation. For purposes of this first Office action on the merits, the examiner will presume that meeting attendees were able to view/read the contents of the 22 pages such that the document represents a written disclosure with a publication date of April 2002.

2. Claims 10-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 10-13 require an aromatic hydrocarbon material having a highest unoccupied molecular orbital that is not more than 0.81 eV less than the highest occupied molecular orbital of a hole transporting material in the first organic layer. The specification does not enable one to make the invention as claimed in claims 10-13. The specification describes selection of materials based on a comparison of highest occupied molecular orbitals and/or a comparison of lowest unoccupied molecular orbitals, but not a comparison of highest unoccupied to highest occupied.

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3. Claims 1-4, 6, 8-18 and 20-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The scope of an "aromatic hydrocarbon" material is not clear given that some of the dependent claims explicitly encompass materials which are not strictly aromatic (such as compounds having one or more alkyl, alkenyl, alkynyl, heteroalkyl or heterocyclic groups) and/or not strictly hydrocarbon (such as compounds having one or more heteroalkyl, substituted heteroaryl or heterocyclic groups). It is not clear if any compound comprising a benzene ring can be considered to be an "aromatic hydrocarbon material" for purposes of the presently claimed invention.

There is no antecedent basis for "the hole transporting material" as recited in claims 10 and 12.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-3, 6, 7 and 9-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Adamovich et al. (MRS Spring Meeting, April 2002).

Adamovich et al. disclose devices comprising, in the order listed, an anode, an organic layer comprising a phosphorescent material, an organic layer that functions as a hole blocking layer and comprises octaphenyl cyclooctatetraene (OPCOT) or sexiphenyl (SP), an organic layer that functions as an electron transporting layer, and a cathode. SP is a compound having the structure II as set forth in present claim 7.

Adamovich's device in which the hole blocking layer comprises SP anticipates the device of present claims 1, 2, 6, 7 and 9-13 (presuming, in the case of claims 10-13, that "unoccupied" should read --occupied--).

Adamovich's device in which the hole blocking layer comprises OPCOT anticipates the device of claims 1-3 and 9-13 (presuming, in the case of claims 10-13, that "unoccupied" should read --occupied--). Regarding claims 2 and 3, OPCOT is a symmetrical compound and therefore has a dipole moment of zero.

6. Claims 1-3, 6, 7 and 9-13 are rejected under 35 U.S.C. 102(e) and 35 U.S.C. 102(a) as being anticipated by Thompson et al. (US 2003/0068528 A1).

Thompson et al. disclose devices comprising, in the order listed, an anode, an organic layer comprising a phosphorescent material, an organic layer that functions as a hole blocking layer and comprises octaphenyl cyclooctatetraene (OPCOT) or a sexiphenyl, an organic layer that functions as an electron transporting layer, and a cathode. For example, see Figures 21-26,

paragraph [0088] and Example 7. The branched sexiphenyl disclosed by Thompson et al. is a compound having the structure II as set forth in present claim 7.

Thompson's device in which the hole blocking layer comprises branched sexiphenyl anticipates the device of present claims 1, 2, 6, 7 and 9-13 (presuming, in the case of claims 10-13, that "unoccupied" should read --occupied--).

Thompson's device in which the hole blocking layer comprises OPCOT anticipates the device of at claims 1-3 and 9-13 (presuming, in the case of claims 10-13, that "unoccupied" should read --occupied--), and the device in which the hole blocking layer comprises the unbranched sexiphenyl anticipates the device of at least present claims 1 and 9. Regarding claims 2 and 3, OPCOT is a symmetrical compound and therefore has a dipole moment of zero.

7. Claims 1-3, 9, 14-17, 20 and 21 are rejected under 35 U.S.C. 102(a) as being anticipated by Okumoto et al. (*Chem. Mater.* Vol. 15, pp. 699-707, published on Web 01/15/2003).

Okumoto et al. disclose the use of the aromatic hydrocarbon materials TBB, TFB and TFPB as hole blocking materials in fluorescent or phosphorescent organic electroluminescent (EL) devices. Depending upon claim interpretation Okumoto's F-TBB may also meet the limitations of an "aromatic hydrocarbon material" as recited in the present claims since F-TBB has an aromatic hydrocarbon core structure. The formulae for TBB, F-TBB, TFB and TFPB are set forth on page 700 of the reference.

Okumoto et al. provide an example of a phosphorescent organic EL device in which F-TBB is used in a hole blocking layer of a device having the structure: anode, organic hole

transporting layer, organic phosphorescent layer, organic hole blocking layer, organic electron transporting layer, and cathode. See the paragraph bridging pages 706 and 707. Although Okumoto et al. do not disclose a specific example of a phosphorescent organic EL device in which TBB, TFB or TFPB is used in the hole blocking layer, such devices are anticipated by Okumoto's teachings of using TBB, TFB or TFPB for the same purpose as F-TBB.

Regarding claims 2, 3, 16 and 17, TBB, TFB and TFPB (and F-TBB) are symmetrical compounds and therefore have a dipole moment of zero.

Regarding the efficiency and lifetime limitations of present claims 14-17, 20 and 21, it is the examiner's position that it is reasonable to expect that these limitations are inherent in a device as described in the paragraph bridging pages 706 and 707 and similar devices in which TBB, TFB or TFPB is used in place of F-TBB given the disclosed external quantum efficiency for the phosphorescent device utilizing F-TBB, the disclosed external quantum efficiencies for the fluorescent devices utilizing these hole blocking materials (the external quantum efficiencies for the phosphorescent devices would reasonably be expected to be higher than those of the fluorescent devices), and the disclosed thermal and morphological stability of the hole blocking materials.

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 14-17 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adamovich et al. (MRS Spring Meeting, April 2002) or Thompson et al. (US 2003/0068528 A1) as applied to claims 1-3, 6, 7 and 9-13 above, and for the further reasons set forth below.

Neither reference discloses a specific example of a device meeting the external quantum efficiency and lifetime limitations required by claims 14-17 and 20-23. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to optimize the device structure so as to optimize external quantum efficiency and device lifetime. Thompson's published application explicitly teaches that quantum efficiency is an optimizable feature (e.g. see paragraph [0133]) and it was well-known in the art at the time of the invention that external quantum efficiency and device lifetime are properties that are affected by device structure.

10. Claims 1-3, 8, 9, 14-17, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. (US 6,830,829 B2).

Suzuki et al. disclose aromatic hydrocarbon materials and teach that they may be used for electron transporting or hole blocking layers in an organic luminescence device in which the light emitting material is a fluorescent or phosphorescent material. For example, see column 10, line 38 through column 40, c. 41, l. 66-c. 42, l. 43, the last formula in c. 45, Examples 46-60 (c. 71) and c. 76, l. 15-21. All of the specific compounds of the formulae shown in c. 10 through c. 40 meet the limitations of an "aromatic hydrocarbon material" if this phrase is interpreted broadly to encompass any compound comprising a benzene ring. If "aromatic hydrocarbon material" is interpreted more narrowly so as to exclude non-aromatic and non-hydrocarbon

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groups, approximately half of the compounds depicted in c. 10-c. 40 meet the limitations of an aromatic hydrocarbon material.

Symmetrical compounds such as compound 59 have a dipole moment of zero as required by present claim 3 and 17.

The device of Example 46 is a device in which the light emitting material is a fluorescent material rather than a phosphorescent material. Based on Suzuki's disclosure of Ir(ppy)₃ (represented by the last formula in c. 45) as a suitable light emitting material, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make devices similar to the devices of Example 46-60 having a phosphorescent emitter such as Ir(ppy)₃ in place of the fluorescent emitter of Example 46.

Suzuki et al. do not explicitly teach the external quantum efficiency and lifetime limitations required by claims 14-17, 20 and 21. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to optimize the device structure so as to optimize external quantum efficiency and device lifetime. It was well-known in the art at the time of the invention that external quantum efficiency and device lifetime are properties that are affected by device structure.

11. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

12. Claims 1-5, 7-9, 14-17, 19-21 and 23 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-5, 7-9, 14-17, 19-21, 23 and 44 of copending Application No. 10/785,287. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

The present claims and the copending claims listed above are substantially identical in claim terminology with the exception that the copending claims use the phrase "aromatic non-heterocyclic hydrocarbon material" whereas the present claims use the phrase "aromatic hydrocarbon material". Using the conventionally accepted meanings of "hydrocarbon" and "heterocyclic", an aromatic hydrocarbon material is necessarily an aromatic non-heterocyclic hydrocarbon material.

Present claims 10-13 are not included in this rejection because they require a comparison of highest unoccupied molecular orbital of the aromatic hydrocarbon material to highest occupied molecular orbital of a hole transporting material whereas copending claims 10-13 require a comparison of highest occupied molecular orbitals. If claims 10 and 12 were amended to read --occupied-- instead of "unoccupied", this rejection would also apply to claims 10-13.

Note that if the present claims are interpreted more broadly such that the aromatic hydrocarbon material can be any compound comprising a benzene ring, then this rejection

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applies only to claims 5, 7, 19 and 23, which require the same specific compound as copending claims 5, 7, 19 and 23, respectively.

13. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

14. Claims 1-4, 6, 8, 9, 14-18 and 20-22 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-4, 6, 8, 9, 14-18, 20-22 and 44-50 of copending Application No. 10/785,287. Although the conflicting claims are not identical, they are not patentably distinct from each other.

If the present claim terminology of “aromatic hydrocarbon material” is interpreted more broadly than implied by the conventional meaning of the term “hydrocarbon” such that any compound is considered to be an aromatic hydrocarbon material so long as it comprises a benzene ring, then present claims 1-4, 8, 9, 14-17, 20 and 21 are broader than copending claims

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1-4, 8, 9, 14-17, 20, 21, 23 and 44 because the present claim language would not exclude heterocyclic groups/substituents from the material.

With respect to present claims 6, 18 and 22, these claims define a slightly different scope of compounds than defined by copending claims 6, 18 and 22 because the R variables are defined differently in the present claims versus the copending claims. For example, while present claim 6 defines R₆-R₁₀ as "selected from the group consisting of alkyl, aryl, heteroalkyl, substituted aryl, substituted heteroaryl and heterocyclic groups", copending claim 6 defines R₆-R₁₀ as "selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, heteroalkyl, and substituted aryl". Each of these claims also encompasses compounds in which none of the R substituents are present, or in which only some of the R substituents are present. There is substantial overlap between the compounds of present claims 6, 18 and 22 and copending claims 6, 18 and 22, respectively. It would have been *prima facie* obvious to one of ordinary skill in the art to utilize unsubstituted compounds within the scope of present and copending claims 6, 18 and 22 (particularly in view of present and copending claims 7, 19 and 23), and to utilize various substituted compounds having substituents within the scope of the claims. The compounds defined in present claims 6, 18 and 22 are also a subset of the compounds defined in copending claims 45-50.

Present claims 10-13 are not included in this rejection because they require a comparison of highest unoccupied molecular orbital of the aromatic hydrocarbon material to highest occupied molecular orbital of a hole transporting material whereas copending claims 10-13 require a comparison of highest occupied molecular orbitals. If claims 10 and 12 were amended

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to read --occupied-- instead of “unoccupied”, and the present claim terminology of “aromatic hydrocarbon material” is broadly interpreted in the manner set forth above, this rejection would also apply to claims 10-13.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

15. Miscellaneous:

A period needs to be inserted at the end of claims 5, 7, 19 and 23.

In line 4 of claims 12 and 14, “an first” should read --a first--.

In line 5 of claim 14, “is comprises” should read --comprises--.

The description of substituents for the aromatic hydrocarbon material as set forth in the specification, including the abstract, is confusing. Paragraph [00040] teaches that the material comprises an aromatic hydrocarbon core optionally substituted with “any suitable substituent”, and sets forth a Markush group of preferred substituents. The Markush group of preferred substituents set forth in paragraph [00040] is different than the Markush group of substituents set forth in the abstract, and different than the Markush groups of substituents set forth in paragraphs [0007], [00043] and [00044]. The examiner notes that a compound such as TPBI, which is set forth in the examples as a comparative compound, has an aromatic hydrocarbon core substituted with substituted heteroaryl groups and thus is an aromatic hydrocarbon material based on the description in the present abstract.

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16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Xie et al. (US 5,989,737) disclose the compound of present formula I (see the last formula in column 7), but disclose the compound for use in a hole injecting and transporting layer.

Stossel et al. (US 2004/0058194 A1 and WO 02/52661) disclose boron and aluminum compounds for use as hole blocking materials in phosphorescent OLEDs. Compounds comprising one or more benzene rings are disclosed (e.g. see paragraphs [0072]-[0079] in the US document and pages 11-13 in the WO document), but it is not clear if these compounds are within the scope of an "aromatic hydrocarbon material" as that terminology is used in the present claims.

17. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax number for Art Unit 1774 is (703) 872-9306 for all official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY
May 25, 2005



MARIE YAMNITZKY
PRIMARY EXAMINER

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